The AFIP in Action

In the Lab, . . . the Field, . . . the Front Lines

Armed Forces Institute of Pathology

ANNUAL REPORT 2004

From the Army Surgeon General

The Armed Forces Institute of Pathology plays a critical supporting role in maintaining the health readiness of our forces deployed in the Global War on Terror. For soldiers, sailors, airmen, and marines, a rapid, accurate diagnosis from the experts at the AFIP means better medical treatment and a faster, safer return to duty.

The AFIP's multidisciplinary approach to diagnosis helps to ensure that our service members, and their families here at home, receive the finest health care available. In 2004, AFIP's world-class staff made the initial diagnosis in over 8,700 cases contributed by military treatment facilities, and made a major diagnostic change in 196 others, directly impacting patient treatment options.

The AFIP is poised to address future military challenges with the world's largest repository of tissue and tumor specimens, molecular and genetic techniques to combat disease, case-based education offerings for military health care providers, and scientific laboratories that provide a full range of new and evolving diagnostic and therapeutic aids to DoD hospital laboratories.

The AFIP has time and again proven to be an essential resource for military medical programs—for the US Army Center for Health Promotion and Preventive Medicine, the US Army Medical Research and Materiel Command, the Defense Threat Reduction Agency, and the DoD Global Emerging Infections System, to name just a few. I look forward to the Institute's continued development of technology and resources in support of military medical operations around the globe.

LTG Kevin C. Kiley, MD
US Army Surgeon General
Commander, US Army Medical Command

The Director's Message

In 2004, the AFIP continued the dynamic challenge of transforming services and realigning resources to meet the requirements of present and future missions. How will we support military medicine in 2005, 2010, and even 2020? I expect that 3 very promising initiatives currently under development at the Institute will play a crucial role in the future of military and civilian medicine.

The first, tissue microarrays (TMA), utilizes our vast repository of 50 million paraffin-embedded blocks and 10 million formalin-fixed tissue specimens. The creation of one unique slide from multiple pathology cases will provide significant opportunities to enhance research and education.

The second initiative is the AFIP Telepathology Program in direct support of the Army Telemedicine Program. In the last year alone, with 26 real-time systems deployed around the world, military cases increased from 268 to 373. Telemedicine offers a practical, cost-saving alternative for military pathologists and physicians in need of our services, and has tremendous potential for biodefense and homeland security.

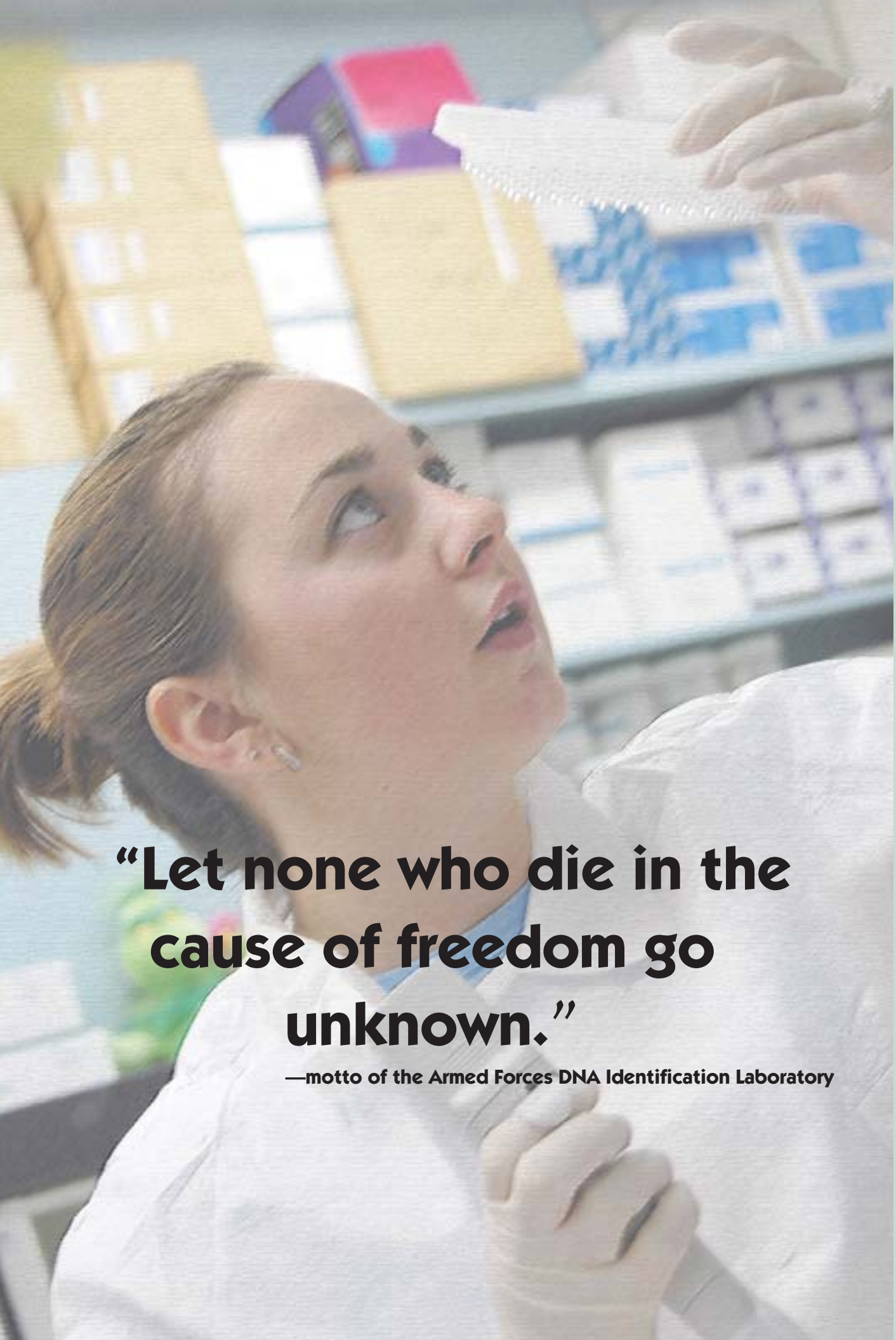
Our third initiative is Ask AFIP™, a Web-based program that premieres in the summer of 2005. Ask AFIP™ will link several of the Institute's unique assets, including case materials, authoritative publications by AFIP staff, and museum collections, to provide an innovative educational experience to military and civilian pathologists, radiologists, and related specialists.

These initiatives, and a strong foundation of world-class pathology expertise, ensure that the AFIP will have a critical role in support of military missions over the next 15 years.

This annual report gives an overview of the critical support the AFIP provided to deployed military personnel around the globe during 2004, including forensic investigations, identifying and treating infectious disease and environmental threats, offering advanced telemedicine, courses, and distance learning for military medical personnel, and collaborating on almost 200 pathology research protocols. Next year, we will continue to focus on restructuring and realigning.

Whatever the mission, wherever the need, the AFIP will use the newest advances in technology, communication, and diagnostics to provide the world's finest pathology and related services to our military personnel and the civilian medical community.

Renata B. Greenspan
COL, MC, USA
The Director



"Let none who die in the cause of freedom go unknown."

—motto of the Armed Forces DNA Identification Laboratory

Dover Port Mortuary

The AFIP in Action: Expert, Effective, Essential

OAFME: Serving the Troops, Supporting Their Families

The Office of the Armed Forces Medical Examiner is the Institute's most direct link to our military troops. Through comprehensive forensic services, DNA identifications, and mortality surveillance programs, the OAFME provides unique and invaluable support to the DoD, our service members, and their families.

Our staff is committed to giving a full account of every military member who dies in service to their country. In 2004, the most challenging year in the history of the Armed Forces Medical Examiner System, our MEs deployed to the Dover Port Mortuary more than 200 days and undertook almost 1,100 death investigations.

Contributing to Force Protection

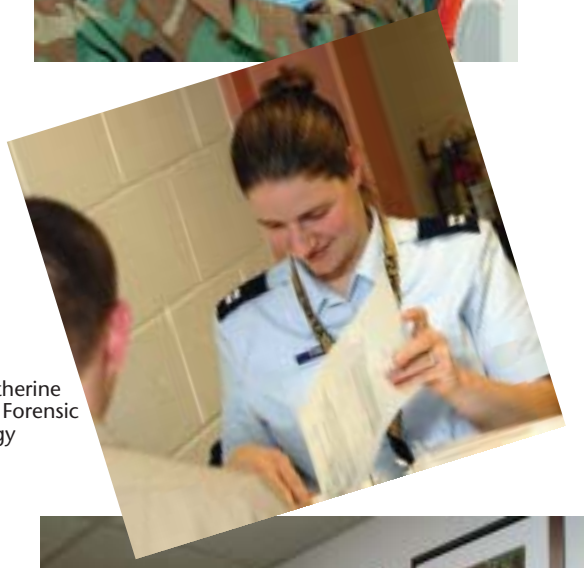
Our autopsy examinations and consultations provide real-time protection against battlefield threats, especially for troops deployed to Iraq. Through onsite investigations, our MEs have correlated tourniquet use with reduced mortality, and pattern injuries with enemy weaponry and personnel configurations in armored vehicles.

Our Ballistics Research Range plays a major role in testing and developing new-generation body armor, such as a new land mine boot, and in conducting research on battlefield injuries, including a new penetrating wound sensor. In 2004 we received a $3.9M grant from the Defense Advanced Research Program Agency to develop new imaging technologies as part of the Joint Combat Trauma Registry.

Investigating Space Crew Safety

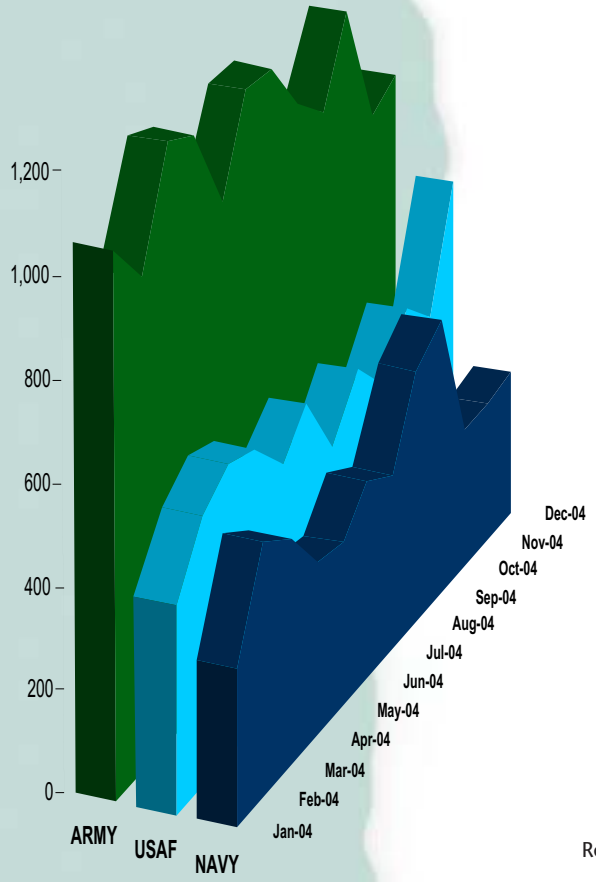
Our office is collaborating with the AFIP's Department of Scientific Laboratories as part of NASA's Space Crew Integrated Investigation Team in an ongoing effort to provide a multidisciplinary approach to forensic examination of crew remains and debris from the space shuttle Columbia. A slide-scanning initiative is underway to establish a registry of remains from Columbia, centralized at the AFIP, as the basis for future studies of space physiology and crew safety issues.

Space Shuttle Columbia Crew



CAPT Katherine Todorov, Forensic Toxicology

Military Consultation Cases CY 2004

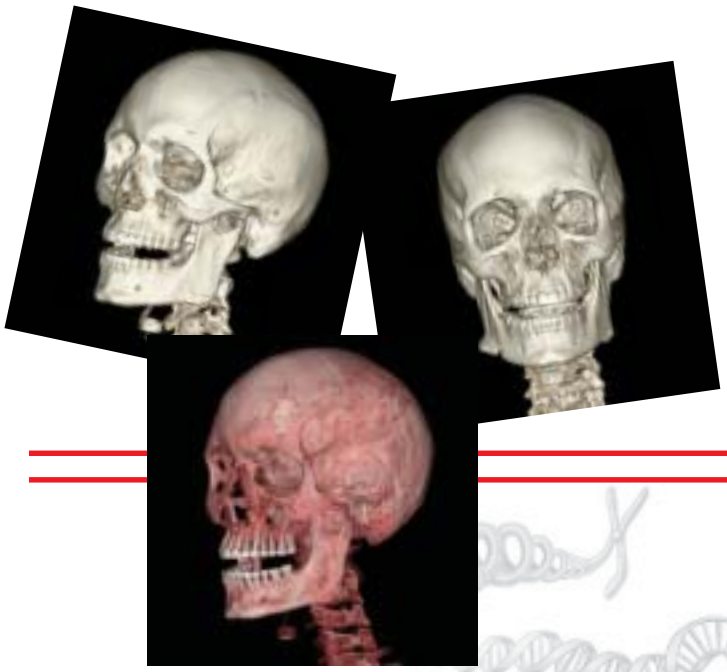


Robert Veasey, OAFME

Pathology Departments Play Essential Role in Forensic Investigations

The **Department of Oral and Maxillofacial Pathology** supports the OAFME by providing forensic dental identification, along with training in forensic odontology for the Army, Navy, and Air Force. Members of the department are ready to deploy within 4 hours of notification. Using state-of-the-art digital technology, they can complete rapid, accurate dental identification within hours of a postmortem examination, facilitating the timely return of remains to the family.

The OAFME's forensic work is further enhanced by the **Department of Radiologic Pathology**, whose DARPA-supported Virtual Autopsy is the only CT autopsy program in the United States. Using digital technology, the Virtual Autopsy can extract previously inaccessible information, document the paths of bullets and other projectiles in 3D, and correlate this information with the use and design of protective body armor.

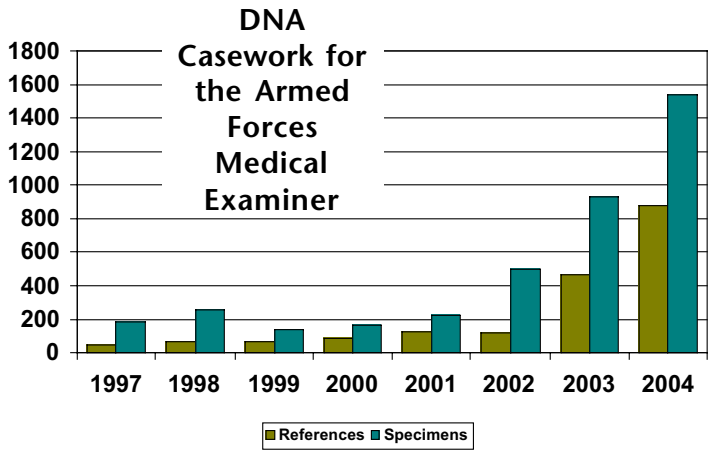


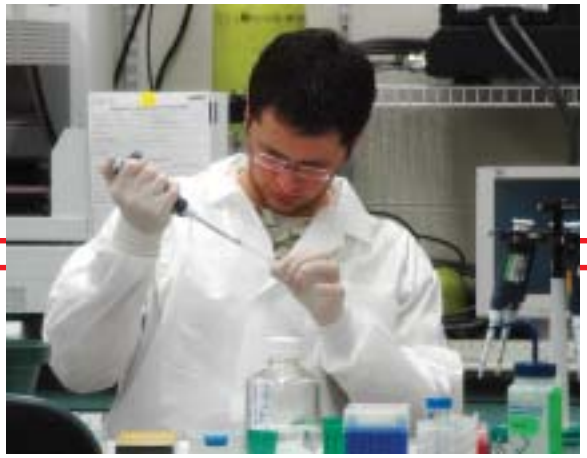
Virtual Autopsy images

DoD DNA Registry: The Critical Component in the Quest to Identify the Fallen

The DoD DNA Registry plays a vital role in managing mass casualties and identifying fallen US service members and the victims of war crimes. We maintain a growing collection of DNA specimen cards, currently representing 96% of the total US military population. In 2004, our world-class facility processed over 17,400 DNA samples, 1,700 of which supported the identification of fallen troops in Afghanistan and Iraq.

The Armed Forces DNA Identification Laboratory (AFDIL) is the military's exclusive resource for forensic identification of fallen American service members, and the world leader in employing mitochondrial DNA typing methods to identify long-missing human remains. In 2004, AFDIL used DNA technology to provide genetic leads in dozens of forensic investigations for the Joint POW/MIA Accounting Command, providing certainty for countless family members.





Blood specimen cards

Scientific Laboratories Provide State-of-the-Art Support to Military and Civilian Medicine

The **Department of Scientific Laboratories** comprises 12 separate labs that provide histotechnical support for all of the case consultations and research projects conducted by the Institute's expert pathologists, ensuring the highest standards in medical and investigative science. In 2004 our technologists completed over 30,000 work orders requiring numerous procedures and special stains, including immunostaining for diagnostic and prognostic markers. All military histotechnologists routinely deploy to the Dover Port Mortuary in support of the OAFME.

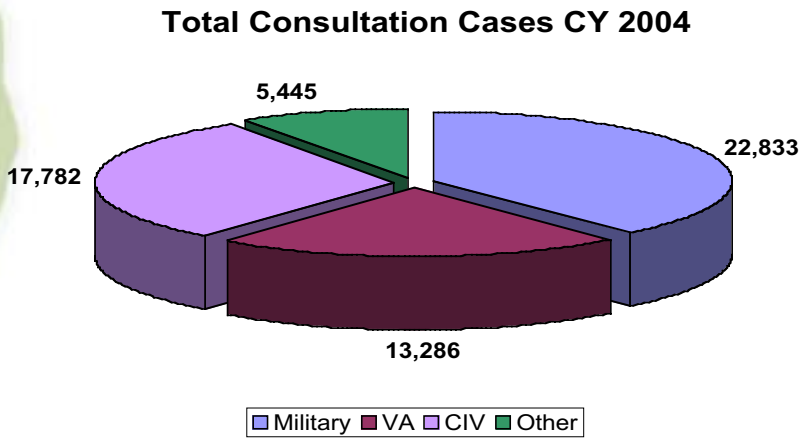
The department's Tri-Service School of Histotechnology is the military's sole resource for basic and advanced training in histology techniques and assistance in postmortem examination.

Telemedicine and Distance Learning Keep Military Doctors Connected

The AFIP's electronic consultation program is the largest and most comprehensive in the world. The **Department of Telemedicine and Distance Learning** partners with WRAMC in managing the Army Telepathology Program, which currently operates 26 dynamic robotic microscopes at Army medical treatment facilities around the world. Our staff is responsible for the installation and maintenance of these systems, and provides full consultative services and training to users.

Leslie H. Sobin, MD, Gastrointestinal Pathology, in the new VTC suite.

This technology allows AFIP consultants to operate microscopes at remote sites and to visualize any field on a slide at any magnification. These real-time consultations keep deployed military doctors connected to pathology resources unavailable in the field, speeding diagnoses and delivery of treatment, and reducing the number of medical evacuations. Opportunities for distance learning, including videoteleconferences originating from our new VTC suite, mean that deployed military doctors can maintain their credentials from anywhere in the world.



We are taking better care of the troops by transforming our business practices while maintaining our scientific excellence.

—Principal Deputy Director, AFIP

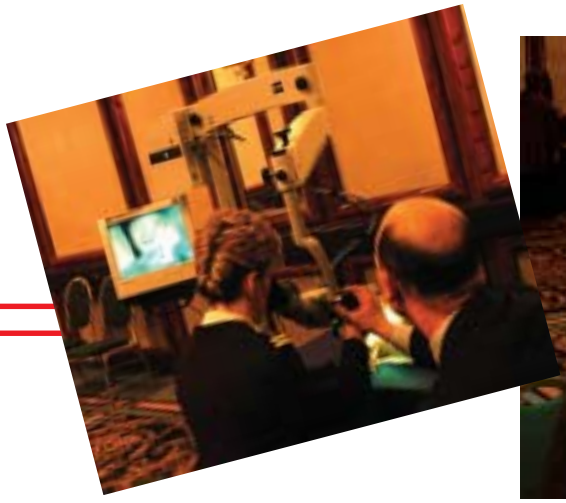
World-Renowned Educational Offerings for Military and Civilian Practitioners

In 2004, the AFIP and ARP offered 42 live courses, 5 conferences, 23 Ground Rounds videoteleconferences, and 7 virtual conferences to 7,459 pathologists, clinicians, legal medicine professionals, veterinary pathologists, radiologists, dentists, forensic scientists, military and civilian residents, and professionals in related disciplines.

The **Department of Medical Education** grants CME credits in pathology, radiology, and related medical disciplines, and coordinates all hands-on training and study visits to the Institute. For example, DOME coordinates the Sexual Assault Response Team Training Program, presented by staff of the OAFME. The program includes laboratory sessions on sexual assault forensic examination, forensic photography, and collection and documentation of physical evidence for military and civilian personnel involved in victim care and medicolegal examination.

Attendance at Live Courses
2000—2004

Attendees	2000	2001	2002	2003	2004
Military	288	444	389	356	592
DoD	40	56	11	22	50
VA	61	55	37	38	24
Civilian	3,218	2,938	2,548	2,012	2,094
TOTALS	3,607	3,493	2,985	2,428	2,760



As a "call asset" to the military, we provide a multidisciplinary analysis of the geographic and environmental factors affecting the health readiness of military service members.

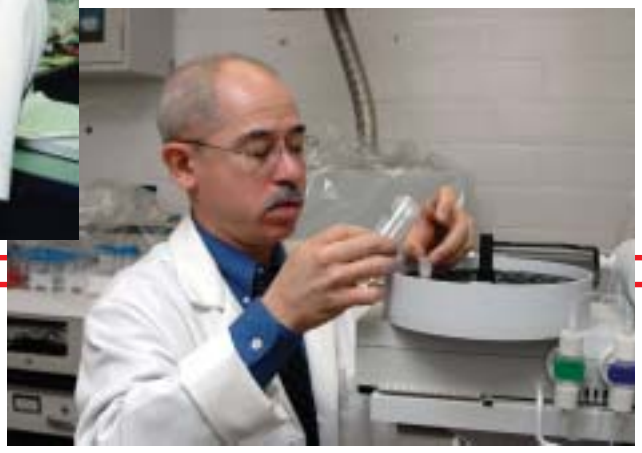
Environmental and Infectious Disease Sciences: A Call Asset for the Military

Depending on where they are deployed, our troops can be exposed to a wide range of contaminants, including heavy metals, funguses, and parasites. Ours is the only laboratory department within the DoD with the expertise to evaluate this spectrum of environmental threats to deployed troops. As a "call asset" to the military, we provide a multidisciplinary analysis of the geographic and environmental factors affecting the health of military service members, including assaults by chemical toxins, biowarfare agents, and depleted uranium.

We maintain registries of specimens from military cohorts such as former POWs and veterans of the Vietnam and Persian Gulf wars. Recently established registries for cases from Afghanistan and Iraq include one for leishmaniasis, developed in collaboration with the **Division of Tropical and Infectious Diseases Pathology**.

The **Division of Microbiology**'s Biosafety Level 3 (BSL-3) labs support numerous DoD missions by preparing high-quality DNA/RNA from biothreat agents, which is used as the standard for assay development and validation in DoD labs, and for proficiency testing for biothreat agent detection. As the primary strain repository for DoD threat reduction intiatives, the BSL-3 labs safely grow and preserve strains of biothreat agents, and confirm diagnoses of suspected infection with biothreat agents submitted by military hospital labs.

Ron Neafie, Infectious and Tropical Diseases Pathology



José A. Centeno, PhD, Biophysical Toxicology

Veterinary Pathologists Play a Key Role in Force Protection and Homeland Security

Army veterinary pathologists play an active and vital role in DoD biomedical research in various aspects of force protection. They are trained to detect foreign animal diseases related to biowarfare or agriterror threats, and are the only DoD personnel trained to conduct postmortem examinations in BSL-4 laboratories. With few exceptions, all active-duty Army veterinary pathologists complete their postgraduate training at the AFIP.

Our veterinary pathologists are providing support to the DoD's wound sensor project, the goal of which is to create a portable circuit to detect penetrating impacts and increase battlefield casualty survival rates.

We provide pathology consultation for military working dogs and marine mammals, and are a source of pathology consultation for a variety of federal agencies, such as the US Customs Service, the Secret Service, and the Border Patrol.

COL Dale G. Dunn
Veterinary Pathology

AFIP necropsy at National Zoological Park

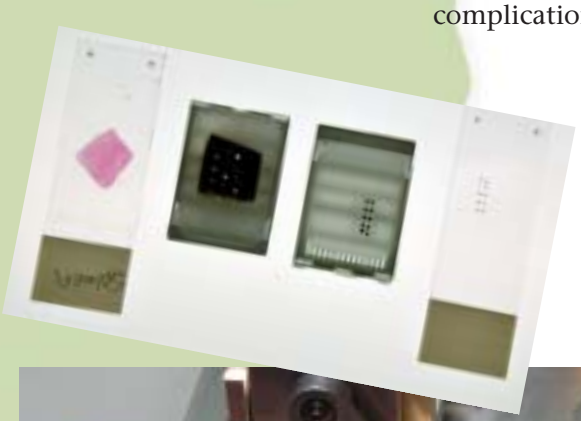
Tissue Microarrays Open New Frontiers in Medical Research

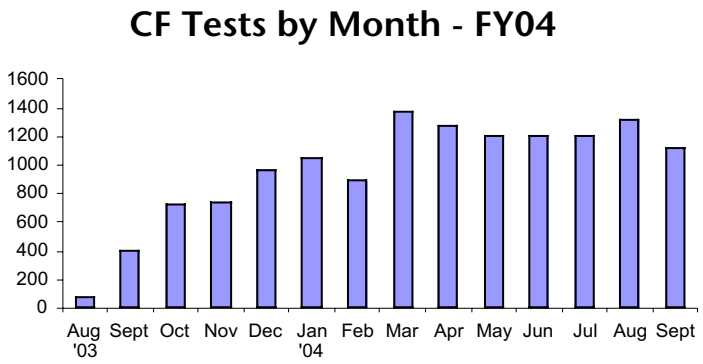
The AFIP's **Department of Scientific Laboratories** has developed a new technology that is a "force multiplier." Tissue microarrays, or TMAs, provide an innovative approach to the microscopic examination of tissue specimens. In traditional tissue-based research, one slide represents one disease process at one site from one patient. With TMA, a single glass slide can hold up to 500 tiny cores punched from conventionally prepared tissue blocks from one or multiple patients. Using TMA, researchers and physicians can learn more in less time, with greater efficiencies in mounting, staining, and storing of specimens.

Robert E. Cunningham, Biophysics, processing TMA slides.

The AFIP is uniquely positioned to take advantage of TMA technology, since it houses the world's largest repository of human tissue specimens. Drawing on the repository's 50 million paraffin blocks and nearly 10 million formalin-fixed tissue specimens documenting an unparalleled array of rare and common diseases, the AFIP can make many thousands of slides without exhausting this historical resource. TMA will greatly facilitate use of the collection, while opening exciting opportunities in military research, academic collaborations, and commercial biotechnology.

The Molecular Diagnostics Laboratory is the primary site for Army cystic fibrosis carrier screening. Centralizing this service at the AFIP, instead of using commercial laboratories, saves the Army hundreds of thousands of dollars a year. The lab conducts a variety of genetic screenings, including tests to identify hereditary disorders that could result in life-threatening complications for deployed troops.





Central Repository and ACTUR Maintain World's Largest Collection of Tissue Specimens

The AFIP maintains a repository of almost 3 million case files and associated microscopic slides, paraffin blocks, and tissue specimens. Access to this vast collection, which includes rare and unusual cases from all over the world, gives the AFIP a unique edge in its consultation, research, and educational endeavors. No other pathology center can match the breadth of resources housed in our Main Repository.

In 2004 we continued our collaboration with Information Manufacturing Corporation of Rocket Center, WV, to convert paper records, photographic media, and glass slides to digital files. So far, IMC has scanned and digitized 4.5 million records and developed a search application that allows quick access to the newly digitized data.

The Automated Central Tumor Registry (ACTUR) collects cancer data from 110 participating military treatment facilities into a central database that currently contains almost 280,000 cases. The goal of ACTUR is to link cancer data from the DoD, Tricare, the VA, and state registries to facilitate treatment outcome, statistical reporting, and uniform data collection. IMC is also working with ACTUR to digitize its records.

IMC, Rocket Center, WV

Alfonzo Riddick, Central Repository

National Museum of Health and Medicine Forges Links with the Community and the Nation

The museum is the public face of the AFIP and the Institute's main conduit of information and awareness to the community at large. As a bridge between military biomedicine and the public, we promote awareness of DoD assets such as the Defense and Veterans Brain Injury Center, and advances in military medicine such as the C-leg, which is playing a vital role in the rehabilitation of soldiers wounded in Afghanistan and Iraq.

As a bridge between military biomedicine and the public, the museum promotes awareness of DoD assets.

The museum has a broad agenda of providing innovative exhibits and educational programs, undertaking scientific and historical investigations, collecting artifacts significant to the history and practice of medicine, and maintaining awareness of critical public and military health issues.

Michael Rhode, NMHM

Radiologic Pathology: At the Forefront of Medical Education

Our world-renowned course in radiologic-pathologic correlation is the cornerstone of our contribution to civilian medicine. Over a thousand residents from 190 programs in diagnostic radiology attended this course, held 5 times in 2004. The course generated revenues of nearly $2M and added more than a thousand new cases to the department's archive of radiologic-pathologic correlation.

LTC Angela Levy, Radiologic Pathology

Also in 2004, we introduced a Web-based educational program called Ask RadPath™, an interactive presentation of case materials and information that allows efficient review of a wide variety of topics, as well as user self-assessment. This milestone in online consultation and education has met with overwhelming approval from users nationwide.

Our most innovative foray into distance learning is AskAFIP™, the online academic face of the Institute. Deployed military doctors can log on to AskAFIP™ at the point of care and search for information on common and rare cases, frequent misdiagnoses, and much, much more. This website is a one-stop resource that combines cases from the AFIP's vast repository with links to published articles by AFIP staff, course syllabuses, our world-renowned fascicles, radiologic-pathologic correlations, and outstanding imagery of gross and histologic specimens and related museum objects. In essence, AskAFIP™ serves as a browser for the Institute's extensive and varied resources.

Military and civilian physicians can earn ACGME-approved CME credits simply by logging time on AskAFIP™. With special components in radiologic and veterinary pathology, AskAFIP™ is reaching out to the widest possible spectrum of potential military and civilian users, including pathologists, radiologists, veterinarians, medical and veterinary students, medical organizations, and health care providers of all kinds.

Experts in Supportive Services Maintain Our World-Class Reputation

The AFIP's outstanding reputation as the gold standard in pathology consultation rests in large part on the expertise of dedicated professionals providing an array of supportive services. For example:

- The **Department of Legal Medicine** has a significant impact on quality assurance and risk management activities of the military health system. Our work in credentials management for the Department of Homeland Security speeds the deployment of emergency responders in national emergencies and military operations. Our work in analyzing and reporting medical malpractice cases improves the quality of medical care for our service men and women.
- The **Center for Clinical Laboratory Medicine** directs the DoD Clinical Laboratory Improvement Program and ensures that military medical laboratory operations fulfill DoD mission requirements. In 2004 the CCLM issued 1,586 laboratory registration certificates for 2,971 military facilities.
- The **DoD Patient Safety Center** maintains the DoD Registry for Patient Safety Data, collected from 143 military clinics and hospitals worldwide. The center provides feedback to these facilities on the root causes of patient mishaps, contributing to improved health care for all service members.

Whatever the mission, wherever the need, the AFIP will provide the world's finest pathology and related services to our military personnel.

—The Director, AFIP

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